DOCUMENT RESUME

ED 063 413 TM 001 740

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|---|---|
| TITLE | Injection-Molding-Machine Tender (fabric-plastics prod.) 556.885--Technical Report on Standardization of the General Aptitude Test Battery. |
| INSTITUTION | Manpower Administration (DOL), Washington, D.C. U.S. Training and Employment Service. |
| REPORT NO | TR-S-228 |
| PUB DATE | Mar 63 |
| NOTE | 7p. |
| EDRS PRICE | MF-$0.65 HC-$3.29 |
| DESCRIPTORS | *Aptitude Tests; *Cutting Scores; Evaluation Criteria; Job Applicants; *Job Skills; Norms; Occupational Guidance; *Personnel Evaluation; Test Reliability; Test Validity; *Unskilled Occupations |
| IDENTIFIERS | GATB; *General Aptitude Test Battery; Injection Molding Machine Tender |

ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

ED 063413

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

INJECTION-MOLDING-MACHINE TENDER (fabric•plastics prod.)

556.885

S-228

TM 001 240

U. S. Employment Service in
Cooperation with
Wisconsin State Employment Service

March 1963

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GATB #2381

# STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

# FOR

# INJECTION-MOLDING-MACHINE TENDER (fabric.plastics prod.) 9-10.10

B-505

## Summary

The General Aptitude Test Battery, B-1002A, was administered to a final sample of 38 women and 36 men employed as Injection-Molding-Machine Tender 9-10.10 by Flambeau Plastics Corporation, Baraboo, Wisconsin and by Plymouth Industrial Products, Incorporated with plants at Plymouth and Sheboygan, Wisconsin. The criterion consisted of supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes P-Form Perception, Q-Clerical Perception, and K-Motor Coordination were selected for inclusion in the final test norms.

GATB Norms for Injection-Molding-Machine Tender 9-10.10 B-505.

| B-1001 | | | B-1002 | | |
|---|---|---|---|---|---|
| Aptitude | Tests | Minimum Acceptable Aptitude Score | Aptitude | Tests | Minimum Acceptable Aptitude Score |
| P | CB-1-A<br>CB-1-L | 85 | P | Part 5<br>Part 7 | 85 |
| Q | CB-1-B | 85 | Q | Part 1 | 85 |
| T | CB-1-G<br>CB-1-K | 90 | K | Part 8 | 95 |

## Effectiveness of Norms

The data in Table IV indicate that 19 of the 25 poor workers, or 76 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 76 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 45 of the 51 workers who made qualifying test scores, or 88 percent, were good workers.

TECHNICAL REPORT

I. Purpose

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Injection-Molding-Machine Tender. (fabric.plastics prod.) 9-10.10.

II. Sample

The General Aptitude Test Battery, B-1002A, was administered on August 12 and 13, 1958 to 24 men and 12 women employed at the Flambeau Plastics Corporation, Baraboo, Wisconsin, and on October 23, 1954 and June 26, 1961 to 15 men and 26 women employed at the Plymouth Industrial Products, Incorporated, Plymouth and Sheboygan, Wisconsin as Injection-Molding-Machine Tenders 9-10.10. Three of the male workers were exluded from the sample; one from the Flambeau Plastics Corporation because of a crippled left arm and hand and two from Plymouth Industrial Products, Inc. because one had less than a sixth grade education and the other had difficulty in working out the paper and pencil exercises. This left a final sample of 74 workers, 36 men and 38 women.

Workers for this occupation are hired on the basis of a personal interview. No tests were used in the selection process. There are no education or experience requirements. The minimum age requirement is 18 years of age. Two weeks are considered the average time for a worker to become proficient on the job. All the workers in this sample had at least two months of experience.

TABLE I

Means (M), Standard Deviations ($\sigma$), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

| N = 74 | M | $\sigma$ | Range | r |
|---|---|---|---|---|
| Age (years) | 32.0 | 10.0 | 18-58 | .113 |
| Education (years) | 10.0 | 1.9 | 6-12 | .037 |
| Experience (months) | 37.6 | 37.7 | 2-226 | .132 |

III. Job Description

Job Title: Injection-Molding-Machine Tender (fabric.plastics prod.) 9-10.10

Job Summary: Molds plastic houseware and industrial items such as dishes, bowls, animals, window frames and brine drums by operating semi-automatic and fully automatic injection molding machine; trims sprue and flashing from articles by hand and machine; performs machine punch, drill and speed lathe finishing operations and packs articles for shipment.

Work Performed: Sprays mold surface with liquid mold release agent using compressed air can or gun. Places inserts into mold cavity to mold them into articles when required. Shuts gate which automatically forces ram against die to release hot plastic into mold. Observes ram pressure gauge and reports low pressure to foreman.

Operates semi-automatic machine: Observes movement of ram to determine when it has completely filled mold. Stops and reverses ram to allow plastic for next operation to flow into place ahead of ram. Controls temperature of mold by adjusting flow of water through mold to cool and solidify plastic. Adjusts automatic timing device regulating time of molding operation to allow for variations in temperature of plastics and atmospheric conditions.

Opens gate and removes article from mold, chute, or water tank and places on bench. Loosens pieces stuck to mold using a rubber hammer. Inspects article visually and/or by feel for cracks, holes, color change and other defects. Notifies foreman or setup man if color changes or defects continue to appear. Sticks quality articles on side tray for trimming and finishing. Discards defective pieces into barrel to be ground for reuse. Trims sprues and flashing (excess plastic at seams or contact points) from articles using nippers, knife and/or speed lathe. Pastes or stamps identifying data on articles by hand or machine as required. Punches or drills holes in articles as required on punch, single, or multiple drill press equipped with special fixtures.

Wraps and packs items in cardboard cartons. May seal cartons with gummer tape and stacks on table or floor for shipment. May maintain record of the number of rejects and the reason. May sweep working area around machine at the end of the shift.

May spot check small industrial items using no-go gauge. Male operators may clean hopper and ram when changing colors. May place defective articles, sprues and flashings into grinding machine which automatically grinds plastic for reuse. May perform other work as required.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion for the Flambeau Plastics Corporation sample consisted of rank-order supervisory ratings made by the foreman in charge. The ratings were based on the quality and quantity of work produced by each worker. Two sets of ratings were obtained; the first on August 13, 1958 and the second on September 2, 1958. The correlation betweeen the two sets of ratings was .865. For the final criterion for this sample, the two rank order ratings were combined and converted to linear scores. The range of criterion scores was 9-91, with a mean of 50.057 and a standard deviation of 19.094.

The criterion for the Plymouth Industrial Products Corporation sample consisted of rank-order supervisory ratings based on the quality and quantity of work made by the Personnel Manager in charge of both the Plymouth and Sheboygan plants. For the group tested on October 23, 1954, only 1 set of ratings was obtained. For the group tested on June 26, 1961, two sets of ratings were obtained, the first on June 27 and the second on July 25, 1961; Since the correlation between these two sets of ratings was .925, the ratings were combined. The final criterion for this sample was rank-order ratings converted to linear scores. The range of criterion scores was 7-93, with a mean of 50.0 and a standard deviation of 18.8.

For the final sample, N=74, the final criterion consisted of the linear scores obtained for the above two subsamples. The range of final criterion scores was 7-93, with a mean of 50.027 and a standard deviation of 18.942.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

Form Perception (P) - required to detect defects, sprue and flashing on molded items.

Motor Coordination (K), Finger Dexterity (F) and Manual Dexterity (M) - required to rapidly and accurately manipulate by hand the compressed air spray can or gun in spraying mold surface, to shut and open the gate of the molding machine, to remove items from the molds, to trim sprue and flashing, to perform finishing operations by machine, and to pack items in cartons.

On the basis of the job analysis data, V-Verbal Aptitude and N-Numerical Aptitude were rated "irrelevant" for successfully performing the duties of this job.

B. Quantitative Analysis:

TABLE II

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 74

| Aptitudes | M | σ | r |
|---|---|---|---|
| G-Intelligence | 97.6 | 13.4 | .220 |
| V-Verbal Aptitude | 95.7 | 14.2 | .147 |
| N-Numerical Aptitude | 97.0 | 15.8 | .283* |
| S-Spatial Aptitude | 96.8 | 14.9 | .094 |
| P-Form Perception | 99.6 | 14.7 | .524** |
| Q-Clerical Perception | 102.2 | 14.2 | .456** |
| K-Motor Coordination | 103.6 | 18.3 | .578** |
| F-Finger Dexterity | 96.9 | 21.4 | .475** |
| M-Manual Dexterity | 107.8 | 21.3 | .458** |

*Significant at the .05 level
**Significant at the .01 level

C. Selection of Test Norms:

TABLE III

Summary of Qualitative and Quantitative Data

| Type of Evidence | Aptitudes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | G | V | N | S | P | Q | K | F | M |
| Job Analysis Data | | | | | | | | | |
| Important | | | | | X | | X | X | X |
| Irrelevant | | X | X | | | | | | |
| Relatively High Mean | | | | | | X | X | | X |
| Relatively Low Sigma | X | X | | | X | X | | | |
| Significant Correlation with Criterion | | | X | | X | X | X | X | X |
| Aptitudes to be Considered for Trial Norms | | | | | P | Q | K | F | M |

Trial norms consisting of various combinations of Aptitudes P, Q, K, F & M with appropriate cutting scores were evaluated against the criterion by means of the Phi Coefficient technique. A comparison of the results showed that B-1002 norms consisting of P-85, Q-85 and K-95 had the best selective efficiency.

## VII. Validity of Norms

The validity of the norms was determined by computing a Phi Coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 34 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV shows the relationship between test norms consisting of Aptitudes P, Q and K with critical scores of 85, 85 and 95, respectively, and the dichotomized criterion for Injection-Molding-Machine Tender 9-10.10. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Validity of Test Norms for Injection-Molding-Machine Tender 9-10.10
(P-85, Q-85, K-95)

| N = 74 | Non-Qualifying Test Scores | Qualifying Test Scores | Total |
|---|---|---|---|
| Good Workers | 4 | 45 | 49 |
| Poor Workers | 19 | 6 | 25 |
| Total | 23 | 51 | 74 |

Phi Coefficient = .69
$\chi^2$ = 35.535
P/2 < .0005

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

## VIII. Conclusions

On the basis of the results of this study, Aptitudes P, Q and K with minimum scores of 85, 85 and 95, respectively, have been established as B-1002 norms for Injection-Molding-Machine Tender 9-10.10. The equivalent B-1001 norms consist of P-85, Q-85 amd T-90.

## IX. Determination of Occupational Aptitude Pattern

The specific norms established for this study did not meet the requirements for incorporation into any of the existing 35 OAP's (revised 10/61). The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.